CLAIMS

1. In a tank installation for a volatile liquid and having a fill-pipe for the introduction of the liquid into the tank wherein the exit to which fill-pipe is normally below the liquid level in the tank, a vapour recovery system for use during filling of the tank which system comprises:

– means defining a reduced cross-sectional area region of the fill pipe;

– a duct extending from the region of reduced cross-sectional area through the side wall of the fill-pipe to open into the ullage space above the liquid level in the tank; and

– a normally-closed valve assembly associated with the duct which valve assembly normally closes off the communication of the region of reduced cross-sectional area and the ullage space, but which valve is opened by flow of liquid along the fill-pipe into the tank, such that vapour in the tank may be drawn along the duct from the ullage space by the reduced static pressure in the region of reduced cross-sectional area of the fill-pipe.

2. A vapour recovery system as claimed in claim 1, wherein the duct has a first portion which extends from the region of reduced cross-sectional area of the fill-pipe upwardly away from the exit of the fill pipe, and a second portion which extends from the first portion generally outwardly of the fill pipe to communicate with the ullage space of the tank.

3. A vapour recovery system as claimed in claim 2, wherein the normally-closed valve assembly is formed between the first and second portions of the duct.

4. A vapour recovery system as claimed in claim 2 or claim 3, wherein the first portion of the duct is defined by a tube mounted co-axially within the fill-pipe with its lower end in the vicinity of the region of reduced cross-sectional area of the fill-pipe.

5. A vapour recovery system as claimed in claim 4, wherein the tube is mounted for sliding movement co-axially within the fill-pipe, and forms a part of the normally-closed valve assembly of the vapour recovery system.

6. A vapour recovery system as claimed in claim 5, wherein the tube is spring-urged upwardly to a first position where the valve assembly is closed,

and is moved downwardly against the spring-force the under the action of the in-flow of liquid, down the fill-pipe into the tank.

7. A vapour recovery system as claimed in claim 6, wherein the tube is fitted with a spoiler lying in the liquid flow path along the fill-pipe, whereby the in-flow of liquid acts on the spoiler and so moves the tube downwardly against the spring-force.

8. A vapour recovery system as claimed in claim 7, wherein the spoiler is in the form of one of a vane or paddle projecting into the liquid flow, or an annular cup surrounding the outer surface of the tube and arranged to catch liquid flow.

9. A vapour recovery system as claimed in any of claims 5 to 8, wherein the tube is mounted in a carrier which defines the second portion of the duct, the second portion being opened to the interior of the tube when the tube moves to open the valve assembly.

10. A vapour recovery system as claimed in claim 9, wherein the tube is provided with a head adjacent the carrier which head is provided with a plurality of relatively small holes through which vapour passes, on being drawn from the second portion of the duct to the first portion thereof, whereby the vapour is expanded and cools promoting the condensation thereof.

11. A vapour recovery system as claimed in claim 9 or claim 10, wherein the a seal arrangement is provided between the tube and the carrier, to seal the second portion of the duct from the interior of the tube when valve assembly is closed.

12. A vapour recovery system as claimed in claim 11, wherein the seal arrangement includes a first seal member to seal off the upper end of the tube from the second portion of the duct.

13. A vapour recovery system as claimed in claim 12, wherein the seal arrangement includes a second seal member to seal the exterior surface of the tube to the carrier, at least when the valve is in the normally-closed setting.

14. A vapour recovery system as claimed in any of claims 10 to 13, wherein the carrier defines three second duct portions each extending generally outwardly from a central region of the carrier to the outer surface of the fill-pipe.

15. A vapour recovery system as claimed in any of the preceding claims, wherein the region of reduced cross-sectional area of the fill-pipe is defined by an insert fitted to the internal wall of the fill-pipe.

16. A vapour recovery system as claimed in any of claims 2 to 14, wherein the region of reduced cross-sectional area of the fill-pipe is defined by an element fitted to the end of the first portion of the duct, nearer the exit of the fill-pipe.

17. A vapour recovery system as claimed in any of the preceding claims, wherein the region of reduced cross-sectional area of the fill-pipe serves to define a venturi within which the speed of liquid in-flow will be increased.

18. A vapour recovery system as claimed in any of the preceding claims, wherein the system is formed as a separate integral unit adapted for fitting to a fill-pipe.

19. A vapour recovery system as claimed in claim 18, wherein the separate integral unit is provided with a connector at each of its two ends, respectively for the coupling thereto of an upper fill-pipe section and a lower fill-pipe section.

20. A vapour recovery system as claimed in claim 1 and substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

21. A method of recovering vapour displaced from the ullage space of a tank installation during the introduction of a volatile liquid into the tank through a fill-pipe wherein the exit from the fill-pipe is normally below the liquid level in the tank, there being a reduced cross-sectional area region provided within the fill pipe, in which method vapour is drawn by a reduced pressure generated in the region of reduced cross-sectional area of the fill-pipe by the in-flow of liquid, the vapour being drawn through the side wall of the fill-pipe along a duct communicating between the ullage space and the region of reduced cross-sectional area, a normally-closed valve assembly being associated with the duct and which normally closes off the communication of the region of reduced cross-sectional area and the ullage space, which valve assembly is opened by the in-flow of liquid along the fill-pipe into the tank, such that the reduced static pressure in the region of reduced cross-sectional area draws vapour in the tank

into the opened duct to be entrained in the in-flowing liquid.

22. A method of recovering vapour displaced from the ullage space of a tank installation during the introduction of a volatile liquid into the tank according to claim 21 and substantially as hereinbefore described, with reference to the accompanying drawings.